



Street Smart Fact Sheet

Streets, roads, highways and other large paved surfaces are the largest single source of pollution under the control of local municipal governments. Street debris and contaminants are the most readily controllable source of urban stormwater pollution. Street sweepings can contain fine sediments, trash, leaves, organics, oil and grease. Maintenance work like concrete repair, saw cut slurry, asphalt repair and painting can also be a source of storm water pollution. The effectiveness of street sweeping is a function of both equipment and the frequency of sweeping.¹

Types of Street Sweepers

Mechanical Broom

- Rotating brushes (gutter broom and cylindrical, rotating broom which carries the material on to belt and into hopper) and water spray.
- Advantages: Pick up trash, road debris, gravel, coarse sand, wet leaves etc. Good for chip seal. Cost less.
- Disadvantages: Not good for fine sands, sediment or silt. Creates fugitive dust.
- Pick-up Efficiency: 86.3% - 98%²
- Manufacturers/Models:
 - Schwarze Industries M-Series <http://products.schwarze.com/M-Series/m5000.html>
 - Allianz Sweepers <http://www.allianzsweeper.com/>
 - Elgin Sweepers http://www.elginsweeper.com/Products_850.asp
 - http://www.elginsweeper.com/WaterlessDustControlTechnology_1834.asp
 - Western Sweeper Sales http://www.westernstreetsweepers.com/end_dump_sweeper.html
- Approximate Cost Range: \$100,000 +

Vacuum-assisted Wet

- Uses gutter broom to push particles into the vacuum. Equipped with water spray.
- Advantages: Good for both coarse and fine materials. Good for large pollutants (trash, road debris, and vegetation). Some models are certified for PM-10.
- Disadvantages: Dirt is saturated with water. Do not pick up wet vegetation or very large road debris very well. Leave fine silts that can wash off road. Un-reliable, lots of repairs.
- Manufacturers/Models:
 - Allianz Sweepers <http://www.allianzsweeper.com/content/vt650.php>
 - Elgin Sweepers http://www.elginsweeper.com/AirSweepers_1233.asp
- Approximate Cost Range: \$200,000 +

Vacuum-assisted Dry

- Uses gutter broom to push particles into the vacuum. No water spray.
- Advantages: Good for both coarse and fine materials. Good for large pollutants (trash, road debris, and vegetation). Some are certified for PM-10 and have continuous filtration system. Useful at industrial sites. Can achieve 50-88% reduction in sediment loading.
- Disadvantages: Does not pick up wet vegetation or very large road debris. Leave fine silts that can wash off road. Un-reliable, lots of repairs.
- Pick-up Efficiency: ~99.5%²
- Manufacturers/Models:
 - Allianz <http://www.allianzsweeper.com/content/vt650.php>
 - Elgin Sweepers http://www.elginsweeper.com/AirSweepers_1233.asp
- Approximate Cost Range: \$200,000 +

Regenerative Air

- Re-circulated air is blown on to pavement and a vacuum removes the air-borne particles.
- Advantages: Removes both coarse and fine materials from pavement with cracks and un-even surfaces. Significantly greater removal of fine materials and soluble pollutants than mechanical sweepers. PM-10 certified.
- Disadvantages: Particles that are not picked up may wash off and leaves streaks of dirt on road surface. Difficult to clean out hopper due to compaction of debris.
- Pick-up Efficiency: 96-99%²

- Manufacturers/Models:
 - Schwarze Industries A-Series (<http://products.schwarze.com/A-Series/dxr.html>)
 - Tymco Models (<http://www.tymco.com/Models.html>)
 - Allianz Sweepers <http://www.allianzsweeper.com/>
 - Elgin Sweepers http://www.elginsweeper.com/Crosswind_1242.asp
- Approximate Cost Range: \$200,000 -\$250,000 +

Tandem (Mechanical and Vacuum-assisted)

- Utilizes a mechanical sweeper followed immediately by a vacuum-assisted sweeper.
- Advantages: Picks up both fine and coarse particles.

Frequency of Sweeping

Frequencies can vary widely with the municipality and their budget. Most cities sweep arterials, business districts and industrial areas more frequently than residential streets. Most cities also sweep in the spring and fall for leaf clean-up and following snow storms/sanding events in the winter for compliance with Colorado’s Air Quality Control Commission’s Regulation 16. Regulation 16 requires sweeping within 4 days of the sanding event, reducing levels of sand usage by 30% from the base level and using more durable materials as defined in the regulation (<http://www.cdphe.state.co.us/regulations/airregs/100118aqccstreetsandingemissions.pdf>). Municipalities should study their “loads to routes” ratios. Routing changes can greatly increase efficiency. Having dump trucks available to follow sweepers during busy sweeping times can also save money and time. Some cities have routed their sweepers to always make right turns; this also increases efficiency.

Suggested Sweeping Frequencies

Area	Minimum	Maximum
Arterials	<i>Every 2 weeks</i>	<i>Weekly</i>
Commercial areas	<i>Every 2 months</i>	<i>Monthly</i>
Industrial	<i>Monthly</i>	<i>Every 2 weeks</i>
Central Business District	<i>Every 2 weeks</i>	<i>Weekly</i>
Residential	<i>2x’s/year</i>	<i>4x’s/year</i>
Hot Spots	<i>Every 2weeks</i>	<i>Weekly</i>

Other Street Sweeping Best Management Practices (BMP’s)

Schedule sweeping:

- Immediately after special events like street fairs, art shows and parades where additional debris is likely to have accumulated.
- Immediately after street repair projects that involve saw cutting, chip sealing or other operations that might have left wastes or debris on road surfaces.
- During new construction projects involving temporary storage of construction materials like dirt, sand and road base along the roadway.
- Immediately following median grass cutting operations.
- Operate all sweepers according to manufacturer’s recommended settings and standards including sweeper speed, brush alignment and rotation rate.
- Written, standard operating procedures and schedules should be available and list the names and sweeping priority of the streets.

Parking Restrictions/Sign Posting

- Consider using street signage or windshield flyer placements advising residents of “No Parking - Street Sweeping” days. Consider enforcement for parked vehicles that consistently ignore the no parking days. The City of Denver generated \$2.3 million in fines from ticketing illegally parked cars on sweeping days.

Cleaning of the Sweeper

- Sweeper wastewater must be decanted to the sanitary sewer.
- Debris from sweeper hoppers must be collected and taken to a secure, temporary, storage area or directly to its’ permanent disposal site. Do not empty sweeper hoppers, even temporarily, onto areas near storm drains or surface water bodies or where wind or rain could re-entrain or scatter the debris

Storage and Disposal of Sweeping Debris

- Debris should be stored at a designated disposal area (preferably on an impervious surface with containment and plumbed to sanitary sewer) and taken to the landfill regularly. The storage area should be more than 100 feet from and at a lower elevation than any water body, creek, river, ditch or storm drain

inlet. Ensure that any temporary storage areas for debris are protected from wind or rain re-entrainment. Provide for erosion and/or sediment control on all areas subject to erosion.

- Inspect and maintain any temporary debris storage areas. If debris is stored in containment or under covers, repair any cracks or splits that might allow debris to escape back into the environment.
- Disposal of debris should be done on a regular basis and debris should not be allowed to accumulate. The number of loads or cubic yards disposed of should be tracked.

Analytical Testing of Sweeping Debris

- The amount of debris collected should be measured in cubic yards or by weight. Records should be kept and analyzed.
- Debris should be tested to determine hazardous contaminants such as: in-organics including heavy metals such as copper, lead, zinc and arsenic; chlorides; volatile organic compounds; semi-volatile organics including polycyclic aromatic hydrocarbons; and petroleum products.
- The type of sweeper used may determine the types of contaminants tested.

Reuse Options for Sweepings with Analytical Testing³:

- “Clean” debris can be re-used as fill material provided the testing shows that the concentrations are below the industrial/commercial direct exposure limits. Street sweepings should not be used as fill in areas that could easily be exposed or used at the surface at residential properties, public playgrounds, or recreational facilities. The City of Louisville gives away their sweepings to citizens and asks them to sign a waiver that they understand that the material may have trash in it.
- Screens can be used to separate out trash and other larger debris.
- Sweepings can be used for spill clean up of hazardous materials. The hazardous material and sweeping waste must be handled in accordance with the requirements for hazardous materials and properly disposed of as hazardous waste.

Reuse Options for Sweepings without Analytical Testing³:

- Mix with new salt/sand for winter application to roads.
- As the sub-grade beneath a paved municipal road or parking lot, or for filling potholes provided the sweepings are covered by asphalt.
- As aggregate in concrete or asphalt.
- As cover at lined landfills. Check with local landfills for their requirements.

Snow Removal/Plowing

- Written, standard operating procedures, schedules, and plow route priorities must be documented.
- Never plow, push, blow or store excess snow, deicer, or other debris into creeks, watercourses or storm drainage systems.
- Reduce plowing speed in sensitive areas (near creeks, wetlands or other water courses) to prevent snow and deicing materials from entering waterways. Stop side-cast plowing within 50 feet of bridges.

Snow Storage Areas

- Snow disposal areas should be located at least 100 feet from any storm drain inlets, drainage ditches, ponds, creeks or wetlands.
- If possible, store excess snow in a pervious area where melt water can infiltrate into the ground and not into storm drain system. If possible, allow runoff to filter through a vegetated buffer prior to reaching streams or wetlands.

Salt or De-Icer Application

- When loading salt/sand mix or liquid de-icer, care should be taken not to overfill the truck or tank. Loading areas and yards should be swept frequently to prevent salt or sand build-up and run-off. Place berms or waddles where runoff leaves the yard to contain any salt waste.
- Use the lowest application rate that will be effective. Ensure that the equipment is calibrated to optimum levels according to the manufacturer’s instructions.

The contents of this resource sheet are accurate to the best knowledge of PACE staff. All references to products, retailers, or manufacturer are for informational purposes only and do not represent an endorsement of any particular product or entity by the PACE Program.



References and Links

¹ Schilling, J.G., "Street Sweeping – Report No. 1, State of the Practice", Prepared for Ramsey-Washington Metro Watershed District (<http://www.rwmwd.org/>). North St. Paul, Minnesota. June 2005.

² City of Seattle Street Sweep Project,
[http://evs1a/exchweb/bin/redirect.asp?URL=http://www.seattle.gov/util/Services/Drainage %26 Sewer/Keep Water Safe %26 Clean/Street Sweep Project/SPU01_002014.asp](http://evs1a/exchweb/bin/redirect.asp?URL=http://www.seattle.gov/util/Services/Drainage%26Sewer/KeepWaterSafe%26Clean/StreetSweepProject/SPU01_002014.asp)

³ State of Connecticut Department of Environmental Protection, "Guideline for Municipal Management Practices for Street Sweepings & Catch Basin Cleanings"
http://www.ct.gov/dep/lib/dep/waste_management_and_disposal/solid_waste/street_sweepings.pdf

⁴ Sutherland, Roger C. and Gary Minton, "Minimizing Stormwater Runoff Pollution through Sweeping Program Maximization", presented at Pavement Cleaning BMPs for California Roadway Sweeping Seminar, 2007.

⁵ Breault, Robert F., Kirk P. Smith, and Jason R. Sorenson, "Residential Street-Dirt Accumulation Rates and Chemical Composition, and Removal Efficiencies by Mechanical- and Vacuum-Type Sweepers, New Bedford, Massachusetts", Study Conducted 2003 - 2004.
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⁶ Selbig, William R., and Roger T. Bannerman, "Evaluation of Street Sweeping as a Stormwater Quality Management Tool in Three Residential Basins in Madison, WI", Scientific Investigations Report 2007-5156, U.S. Department of the Interior, U.S. Geological Survey
<http://www.cityofmadison.com/engineering/stormwater/documents/FinalReport1.pdf>

⁷ Various authors, "Street Sweeper Studies", World Sweeper.com
<http://evs1a/exchweb/bin/redirect.asp?URL=http://www.worldsweeper.com/Street/Studies/index.html>

⁸ Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin. <http://www.worldsweeper.com/Street/Studies/CWPStudy/CBStreetSweeping.pdf>

⁹ Rosselot, Kirsten Sinclair, "Copper and Solids Removed Via Street Sweeping", prepared for The Brake Pad Partnership. http://www.worldsweeper.com/Street/Studies/pdf/CopperRemovalBrakePadPtnrshp3_07.pdf

